MINERALS OF THE YUKON

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W.V. Smitheringale

The subject "Minerals of the Yukon" can be treated in two ways. One would be a learned discussion on a purely mineralogical basis, a field into which I do not feel fully competent to enter, and I doubt if many here would be too interested in such a discussion. The other approach to the subject is an attempt to outline or indicate what bearing the minerals within the Territory may have on its economy and development. On this basis, I think it is important to remind ourselves that if there is to be any continuing exploration for and development of the mineral resources, there must be a profit realized on the money and effort expended. By this, I mean a net profit in dollars and cents, to the companies investing their money in an inherently high risk enterprise.

Adverse factors associated with development and mining in the Yukon are: severe winter conditions; distance from consuming markets and from source of supply of both materials and adequate experienced labour; inadequately developed transport routes; and lack of cheap power. These all add to cost of operation. The prevailing mantle of rubble and talus under permafrost conditions adds difficulty and expense during the prospecting and initial exploration stages. All these factors are not constant but change with location and time. During the last ten years there has been appreciable improvement in some, particularly in relation to transportation routes and equipment. It can be anticipated further changes will take place.

Within the Yukon Territory there are only two mineral occurrences that can be classed as mineral resources, in the sense that they are in profitable operation and, accordingly, contributing positively to the economy of the Territory - namely, Y.C.G.C. and U.K.H.M. To these can be added a number of small privately owned Placer properties that contribute their share to the local economy, but with due respect, are not a medium of continuing employment. Besides the two operations referred to as positive mineral resources, there are a number of possible or potential mineral occurrences known that may, under more favourable conditions become active producing operations. The general geologic conditions in the Territory are sufficiently favourable to encourage a continuing search for new mineral occurrences of sufficient grade and tonnage to warrant development and production. Exploration expenditures have, in the past, contributed substantially to the economy, and will continue to do so if given encouragement. Of prime importance to maintain this interest is the bringing into production of a new mineral discovery. In the 19 years I have been here, with the possible exception of Cantung, there has not been one new discovery that measures up to this requirement, although there have been several near misses. In evaluating any mineral occurrence in terms of possible production, one of the most important factors to consider is the grade of concentrate that may be made from the primary ore. This of necessity, must be high, in order to meet the cost of transportation, treatment and marketing. For the present, at least, this is a serious restraining factor.

I would like to list some of the mineral occurrences that have been of interest and may form the nucleus of possible future operations. Rough notes follow:

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1. ASBESTOS:

Clinton Creek:

5 million tons of commercial grade asbestos ore has been reported, with possibilities of additional tonnage.

Other Occurrences: Caley Asbestos on Cassiar Cr.
Woodchopper Cr.
Dome at Dawson
Big Salmon Lake area
Big Bend of Salmon
Teslin Lake area

2. COAL, PETROLEUM & NATURAL GAS:

As we are to have papers on "Drilling in the Yukon" by Mr. Campbell, and "Oil and Gas Potential of the Yukon" by Mr. Hunt, they will undoubtedly give some detail on the possible potential of these resources. Accordingly, I will only mention that oil and natural gas have been found by drilling in the Eagle Plains area North and East of Dawson City. Drilling North and West of Fort Nelson is indicating possible gas potential in the Southeast corner of the Yukon.

There are a number of Coal deposits in the Yukon Territory.

(a) DAWSON CITY AREA:

Lignite coal is reported on both Coal Creek and Cliff Creek some 40 miles below Dawson. I had been led to believe this deposit furnished some coal to Dawson in the early days but Dr. Bostock questions this. He does refer to a deposit of lignite coal on Coal Creek, a tributary of Rock Creek some 20 miles East and North of Dawson. He mentions two seams, 2 and 4 feet thick of good grade, blocky lignite, low in ash and resembling "Cannel" coal. A soft clay-like footwall caused difficulty in keeping mine workings open. Some production was made from this occurrence.

(b) BONNET PLUME BASIN:

C. Camsell describes lignite seams in the tertiary rocks found on the South side of the Peel River between the Bonnet Plume and Wind Rivers.

(c) CARMACKS AREA:

(1) Tantalus Butte Mine:
Early reports describe 3 seams - 7'; 9'10"; 8'10". Tonnage estimates are indefinite but give more than 1 million tons of good grade coal. Analyses suggest a Bituminous to semi-Bituminous quality relatively high in ash (10% +).
Presently supplying U.K.H.M. with a limited quantity.

(2)Tantalus Mine:
On the Carmacks side of the Yukon River reports describe three seams (7½; 6½ & 3'). The bottom seam is reported to have coking characteristics but the grade of coke is uncertain. The grade and quantity are similar to the Tantalus Butte Mine.

(3) FIVE FINGERS:

8 miles below Carmacks. East side Yukon River. Two seams - Upper 6"-22" good coal, plus 24" coal and shale exposed in bottom of workings (783' down dip 16° East).

Lower seam approx. 25 ft. lower. 4½ ft. good coal. Reported firm coking qualities.

Bostock estimates the reserves may be small due to the limited area of favourable coal measures.

(4) Bostock estimates the biggest basin of the Jura-Cretaceous coal measures occurs in the Big Salmon & Teslin River area, where he says coal outcrops on Walsh Creek.

(d) DUKE RIVER:

Narrow lignite in Tertiary basin of Duke River West of Burwash Landing. On Granite Creek a 5 ft. seam of lignite is reported.

3. GYPSUM:

Slims River - Snake River

3 a. LIMESTONE:

Limestone is plentiful in the Whitehorse and other areas of the Yukon. At least one deposit of marl of possible limited size, is known.

4. COPPER and COPPER NICKEL:

(a) Copper showings reported from zone running slightly North of West from Worm Lake, a distance of roughtly 40 miles. The mineralization is mainly chalcopyrite. Unless some means is developed to increase the copper content of a chalcopyrite concentrate, it is questionable if these showings will be of much interest under present conditions.

(b) Whitehorse Copper Belt:

Production records indicate some 13.1 million lbs. of copper were produced from the mines in this belt. This production was in the period of 1916-19 and I understand was mostly, if not all, direct shipping ore of the contact metamorphic type.

In recent years, the belt has been under examination on several occasions, with uncertain results.

(c) Quill Creek:

H.B.M. & S. did considerable underground work on the Quill Creek showing and is reported to have developed 737,000 tons assaying 2.04% Ni; 1.42% Cu with some platinum.

The outcrops indicated a replacement type deposit in sediments at and near the contacts of a basic intrusive.

A strong well defined fault zone, showing marked thermal alteration extends along the Northern limits of Quill Creek, Arch Creek and possibly Wolverine Creek. Areas of basic intrusions are exposed along this general zone with, in places, disseminations of pyrrhotite, some pyrite and presumably pentlandite.

(d) White River:

Just Southwest of the highway at White River considerable adit work and drilling was done on a showing in the Southeast wall of the rock bluffs. This work is reported to have exposed 542,000 tons of 1.68% Ni mineralization, which occurs in steeply (85-90°) dipping thin bedded sedimentary rocks.

(e) Kathleen Lake:

Over the last 3 or 4 years a copper property just South and West of Kathleen Lake has been operated on a small scale and in the aggregate has shipped hand-sorted ore to a value in excess of 1/2 million dollars.

This deposit is a replacement type in well altered volcanic rocks along irregular fracture patterns. The copper mineral is mainly bornite, with some chalcopyrite.

(f) Native copper, in various sized nuggets, is found in the gravels of White River to the Northwest and Squaw Creek to the Southeast in B.C. In some areas the geology in the Southwest corner of the Yukon is similar to that on the Alaskan side in the vicinity of Kennicott, and there is always a possibility of a similar type of deposit being found within the Yukon boundaries. The area is favourable for prospecting and under no circumstances should this area be so encumbered that prospecting or mining would be restricted in any manner.

5. GOLD:

Discovery of placer gold on the tributaries of the Klondike River in 1896 sparked the Gold Rush stampede of '98 and led to the subsequent development of the Yukon. I have been advised that the total value of gold produced from the Klondike and Indian River watersheds up to the end of 1962 amounts to $98,300,000.00.

Other localities of gold placer operations, worked either by dredge, hydraulic, or bulldozer, are at:

Upper 60 Mile
Lower 60 Mile
Henderson Creek
Black Hills Creek
Thistle Creek
Canadian Creek
Clear Creek
Haggart Creek & Dublin Gulch
Highet Creek & Johnson Creek
Duncan Creek
Nansen-Pony & Black Creeks
Burwash Creek
Sheep Creek
Livingstone Creek

Lode gold is known to occur in widely separated areas, but to date no economic production has been realized from lode mining. Prospects are found in the Dawson area in the Haggart Creek and Mt. Hinton areas of the Mayo District, in the Ketza River area, and the Nansen Creek-Mt.Freegold area West of Carmacks. It is this latter area at the Southeast end of the Dawson Range that appears to have had a relative concentration of exploration and development. The gold-silver mineralization appears to be related to late Tertiary

intrusives and has many characteristics of epithermal deposits.

Initial interest in the district was shown in the early '30's, when considerable underground work was done on the Mt.Freegold showing and prospecting exposed a number of gold-bearing veins in the immediate area and on Tinta Hill to the East. A small mill was installed on the Mt. Freegold property and a very limited production resulted. Interest was again shown in the late 40's when considerable drilling and underground work was done on the Brown-McDade property with inconclusive results. A revival of interest in 1962 resulted in extensive surface stripping and initial drilling on the Nansen Creek showing of Gordon Dickson's, about one mile West of the Brown-McDade showings. Values and extent of vein structures as exposed are encouraging. The area has potential for lode gold production, possibly on a small tonnage scale.

Deep adit development on the Mt.Freegold property in 1962 encountered the vein zone structure prior to winter shutdown. It is anticipated the structure will be thoroughly explored in subsequent work this year.

6. IRON:

The paper this morning by Mr. Dahlstrom leaves no doubt that Crest Exploration has established a sedimentary iron ore formation of major size and one that may result in far reaching changes in the economy of the Yukon Territory.

To mention any other iron occurrences is an anticlimax. However, D.D. Cairnes, in his report on the Yukon Alaska boundary survey mentions hematite and magnetite occurring in beds of the Tindir formation outcropping South of Cathedral Creek (65°-0'N.) He mentions beds up to 10 ft. in thickness, containing 30-40% Fe, in limited outcrop.

Further to the Southeast, in the vicinity of Shell Creek, a moderately extensive showing of fine grained magnetite was reported in 1956. I understand that within a zone some 300 ft. in width there are 3 steeply dipping horizons or bands, each about 30-40 ft. in width that contain around 30% Fe. This zone was reported to extend for some 4-5 miles to the Northwest.

7. MOLYBDENUM:

Molybdenum is found as an accessory constituent in a number of Granite intrusions.

About 30 miles Southwest of Ross Post, at the head of Groundhog Creek there is a showing of high grade Molybdenite in a skarn zone at the contact of Limestone and Syenite. Intensive development of the showing established a very limited extent to the Molybdenite mineralization.

Late in 1962 a showing of Molybdenite was discovered some 25 miles East of Quiet Lake and South of Nisutlin River. No development work has been done, due to late discovery, but original reports indicate a commercial grade in outcrops occurring irregularly along some 1500 ft. of strike length. This occurrence appears to be Molybdenite in a skarn zone at and near a Syenite contact with sedimentary rocks.

8. SILVER - LEAD:

The mainstay of lode mining in the Yukon has been and is the production from the mines of the Galena - Keno Hills near Mayo Landing. Silver lead ore was first reported in 1903 but production dates from 1919 and has been continuous since then, except for a 6-year break during and immediately after the last war. Available records indicate a total gross production to date, in the order of $131,000,000.00.

The outstanding feature of these deposits, and the one that has allowed profitable operation is the high silver to lead ratio of roughly 4 to 5 oz. Ag per unit of lead, which results in a high grade concentrate.

The mineralization in the Mayo District is fairly wide-spread but, in general, the silver to lead ratio is too low to allow for profitable operation under existing conditions. Recent work in the Haggart Creek section, some 20 miles West of Galena Hill, has exposed a number of mineralized fault zones, with one vein indicating encouraging silver values. In this section there appears to be a change in mineralogy from the galena silver ores, to a mineralization characterized by Stibnite-Jamesonite. These high antimony minerals may cause some difficulties in smelting.

Irregular, but so far, generally low silver-lead values are found on McKay Hill, about 30 miles North of Elsa. Very low grade silver values occur in the galena showings further North in the Carpenter Creek - Castle Hill area.

The galena showings on Rambler Hill, Shanghai Gulch, Lime Creek and 8 mile cabin areas have generally low silver-lead ratios (about 1:1 or less), although there are limited indications to date that some better ratios may be present.

Another zone of silver-lead mineralization extends from about 20 miles South of Ross Post Southeast for some 60 miles, more or less parallel and Southwest of the main Tintina Fault. Some of these showings have a silver to lead ratio around 3 to 3½ to 1, but low ratios of 1:1 or less are also present. Work to date has exposed faulted, irregular veins of limited size. In some instances the work has been inconclusive.

9. LEAD - ZINC:

Several moderate sized lead-zinc showings have been found in the Eastern portion of the Territory.

(a) H.B.M. & S. - are reported to have indicated 10.5 million tons of 5% zinc mineralization near Fuller Lake on the Canol Road.

(b) Prospector Airways developed some 9.4 million tons of lead-zinc mineral reported to assay 3.16% Pb; 4.96% Zn; 0.27% Cu; 1.76 oz Ag and 0.07 oz.Au. This is a replacement deposit in flat to low dipping beds, sufficiently close to the surface to allow open pit operation.

(c) On the Hyland Plateau, about 50 miles Northeast of Watson Lake, A.S. & R. developed 1 million tons assaying 5% Pb; 10% Zn; and 1.8 ozs. Ag. This deposit is now held by Noranda. The mineral occurs in folded generally gently dipping limestone beds in phyllites.

(d) Last Fall Dr. Aho reported an interesting discovery of lead-zinc mineralization South of Frances Lake. This is now referred to as Mt. Hundere deposit. The mineralization is a lead-zinc replacement of limestone in folded phyllites. The Northern of the two exposures strikes North and dips 65°W. There appears to be 2 or 3 en eschelon lenses aggregating 25 ft. in width and some 420 ft. in length. Combined sulphides approximate 18% with slightly more Pb than Zn; 1-2 oz. Ag are present. The gangue is reported to be garnet epidote, diopside and actinolite.

About 2½ miles to the South is another exposure in limestone dipping about 25° S.W. The limestone zone is some 200 ft. thick with bands of phyllite. The main mineralization some 25 ft. in width occurs in a gangue of quartz and fluorite near the hanging wall of the limestone zone, but there is also some mineralization near the foot-wall of the limestone member.

One trench 100 ft. long exposes a 25' width of 50% combined Pb-Zn. 200 ft. Southerly a second trench 160' long exposes a combined Pb-Zn mineralization of 15-20%. There is slightly more Pb than Zn.

Float of uncertain origin is found between the North and South showing.

10. TUNGSTEN & TIN:

(a) Last year "Cantung" brought their tungsten property to production. This is a scheelite ore body occurring in a skarn zone. I am advised they have proved 1.2 million tons assaying 2.47% WO_3. A marked drop in the price of tungsten concentrate immediately following start of production has undoubtedly created difficulties in maintaining profitable operation.

(b) Southwest Potash is reported to have discovered a tungsten prospect in the McMillan Pass area about 120 miles Northeast of Ross Post.

(c) The wolframite, scheelite, cassiterite concentration in the sluice boxes of Dublin Gulch gold placers indicate a bedrock source of these minerals. I do not know of any definite bedrock exposure of the tungsten minerals, but in 1945 a limited amount of work was done on an

irregular showing of cassiterite, in tourmaline, on the right limit of Dublin Gulch. It is open to question if this showing is the main source of the cassiterite in the stream bed.

Considerable scheelite is also found in the gravels and overburden at the head of Canadian Creek.

Stream tin is also reported from some of the Creeks in the Dawson area.

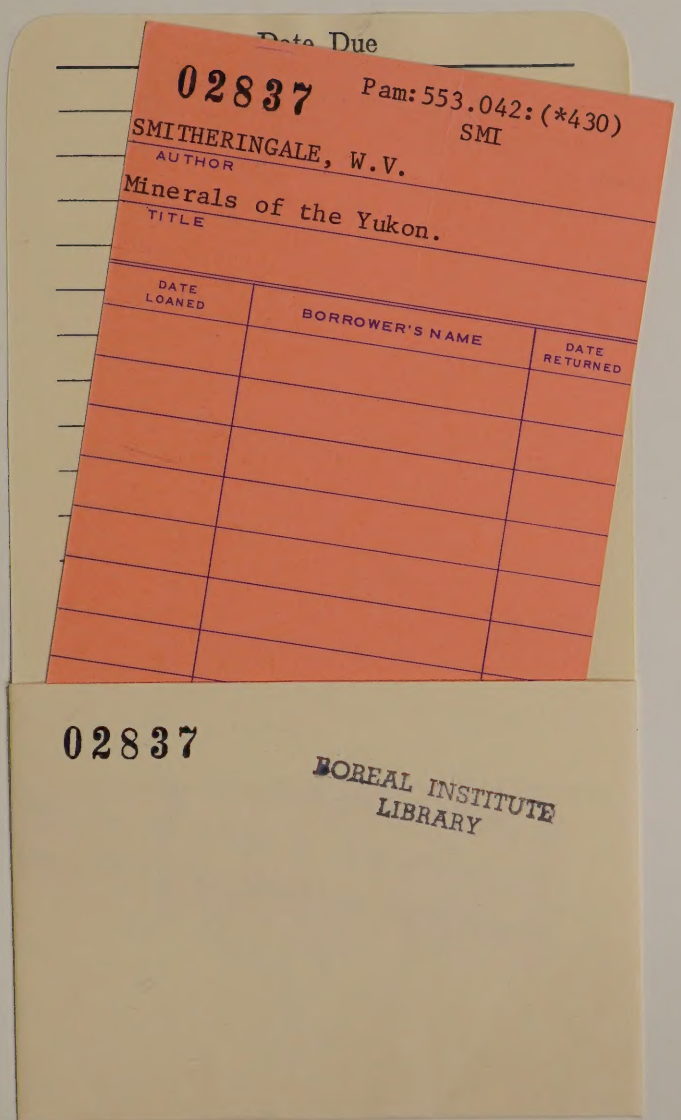
I have tried to give a brief run down of mineral development in the Yukon and without wishing to appear pessimistic, have pointed out some of the limiting factors inherent to the industry. Mining is a one crop industry and it is my belief that the efficient use of our potential mineral resources demands the maximum possible recovery of a diminishing reserve. To attain this end there is need for correlation of all sectors of the community. As pointed out by Mr. Pike this morning, Government is a major shareholder in every mining operation and funnels into its coffers a larger and major percentage of all profits. Another large and critical proportion of every dollar produced from this resource filters through the general economy in wages, and purchase of supplies and equipment. The sale of our metals in world markets contributes an important favourable item in our national trade balance. I believe it is necessary for Government to encourage and assist our mineral development and production by means of favourable legislation and administration both in the Mineral and Taxation Acts. It is also essential that the industry has a well trained and experienced labour force. Those two sectors of the mineral community are very critical in its development and expansion. The high risk exploration and development funds are very sensitive to any adverse changes and will quickly seek less onerous conditions.

I have noted marked beneficial changes in transportation in the last decade and anticipate new techniques, improved units of transport and efficient management will contribute to further reduction of costs.

Reduction in power costs is important. In discussions of cheap power, particularly in our western sphere, I sense the popular thinking gravitates to hydro developments. I ask your indulgence if I appear to take issue with this concept, particularly if it involves flooding vast areas of our valleys. I feel the valleys of our mountainous terrain are very important favourable units in our geographic environment and should not be destroyed hastily for a single resource use, particularly so when alternative sources of cheap power are imminont. We are on the threshold of developing large reserves of natural gas and possibly oil. These are of little value if they cannot be put to use. If pipeline transmission to points of use is not feasible, on-site thermal development is a possibility and the cost of transmission is constant,irrespective of how power is developed. It is true a hole in the ground, supplying fuel to a compact high pressure steam generating plant may not be an imposing sight but it can be a very efficient low cost unit tailored to meet present requirements with material flexibility of expansion as demand increases.

As each new deposit is discovered and developed it becomes increasingly more difficult to find the next. Our exploration sector demands a well trained, experienced and balanced group of individuals and units. I do not think we can afford either of the two extremes; on the one hand, a negative approach of "well lets put a hole in and kill it", nor on the other, an unbalanced optimism that results in excessive expenditures that cannot be supported by a proper assessment of known facts. This takes us one step further into our educational system. The marked decline in registrations and graduations in mining, geology and associated mineral industry courses in recent years, is of more than casual concern. As I have been told often: - "you never miss the water until the well runs dry".

Perhaps I could finish with a somewhat facetious statement by saying "you cannot unscramble an egg". I trust we will not knowingly nor deliberately scramble any of ours.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